RECLAMATION

Managing Water in the West

2017 Colorado River Annual Operating Plan

Colorado River Management Work Group Second Consultation

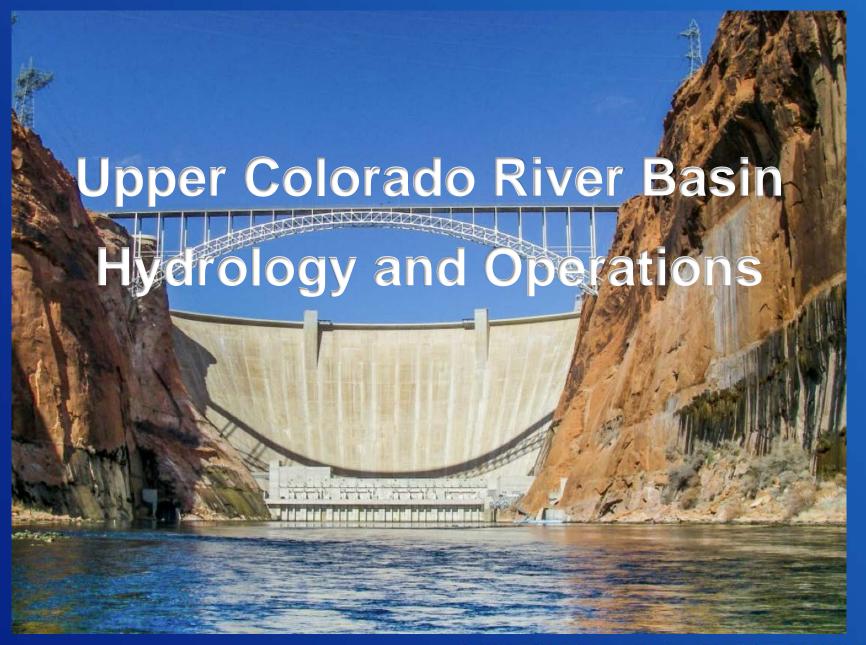
July 28, 2016



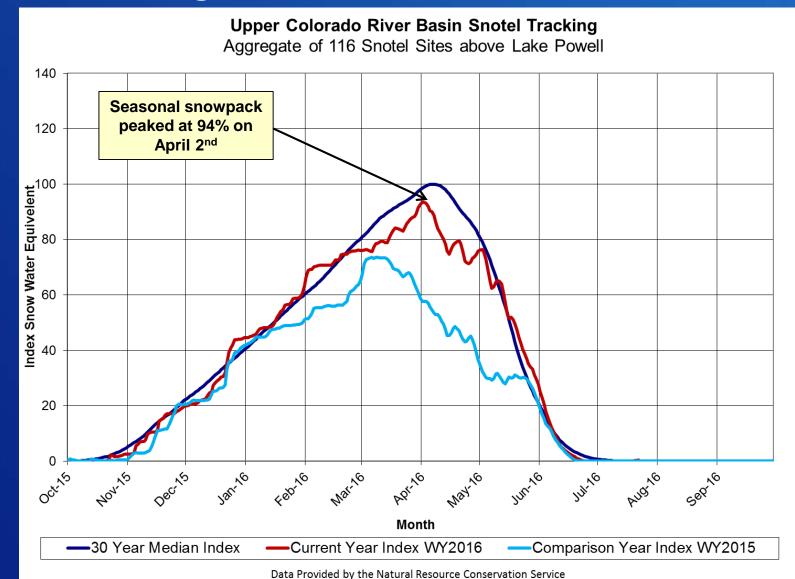
U.S. Department of the Interior Bureau of Reclamation

2017 Colorado River AOP Second Consultation Meeting

- Welcome and Introductions Chris Cutler / Steve Hvinden
- Upper Basin Hydrology and Operations Paul Davidson
- Lower Basin Hydrology and Operations Noe Santos
- Progress in Implementing California's Colorado River Water Use Plan – Tanya Trujillo
- 2017 AOP Review Process Chris Cutler / Steve Hvinden
- Review of Draft 2017 AOP CRMWG
- Conclusion/Wrap-up
- Reminder of Future Meeting Date

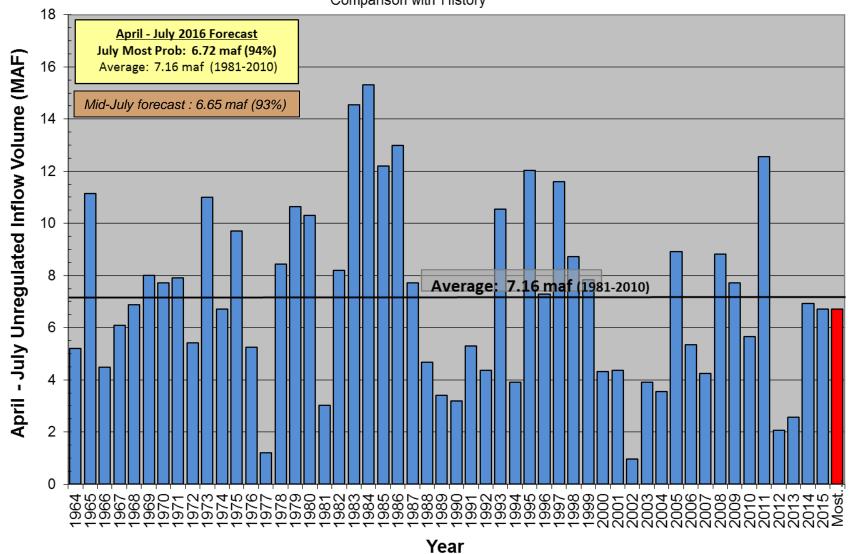


2016 Snow Progression Plot

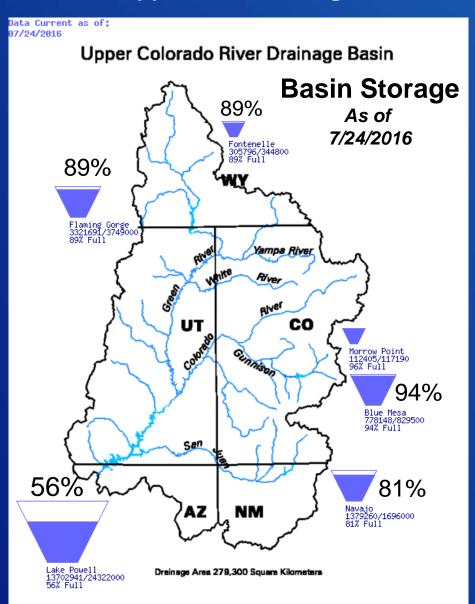


Lake Powell Unregulated Inflow April - July 2016 Forecast Issued July 1st

Comparison with History



Upper Basin Storage



April to July 2016 Forecasted Inflow Issued July 1, 2016

Reservoir	A-J Forecast (KAF)	Percent of Average ¹	
Fontenelle	650	90%	
Flaming Gorge	1,065	109%	
Blue Mesa	615	91%	
Navajo	575	78%	
Powell	6,720	94%	

¹ percent of average based on period 1981-2010.

Projected Operations Water Years 2016 and 2017

Lake Powell & Lake Mead Operational Table

Operational Tiers for Water Year/Calendar Year 2016¹

Lake Powell			Lake Mead		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹	Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹
3,700	Equalization Tier Equalize, avoid spills or release 8.23 maf	24.3	1,220	Flood Control Surplus or Quantified Surplus Condition Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	Upper Elevation Balancing Tier³ Release 8.23 maf;	15.5 - 19.3 (2008-2026)	(approx.) ²	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	(approx.) ²
3 575	if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	9.5	1,105	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf	11.9
3,575 Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet,	ion ier maf;	1,075	Shortage Condition Deliver 7.167 ⁴ maf	9.4	
3,525	release 8.23 maf	5.9	1,050	Shortage Condition Deliver 7.083 ^s maf	7.5
3,490	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	4.0	1,025	Shortage Condition Deliver 7.0 ⁶ maf Further measures may be undertaken ⁷	5.8 4.3
3,370		0	895	be anderenen	0

Diagram not to scale

¹ Lake Powell and Lake Mead operational tier determinations were based on August 2015 24-Month Study projections and documented in the 2016 AOP.



Acronym for million acre-feet

² This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

Subject to April adjustments which may result in a release according to the Equalization Tier

Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

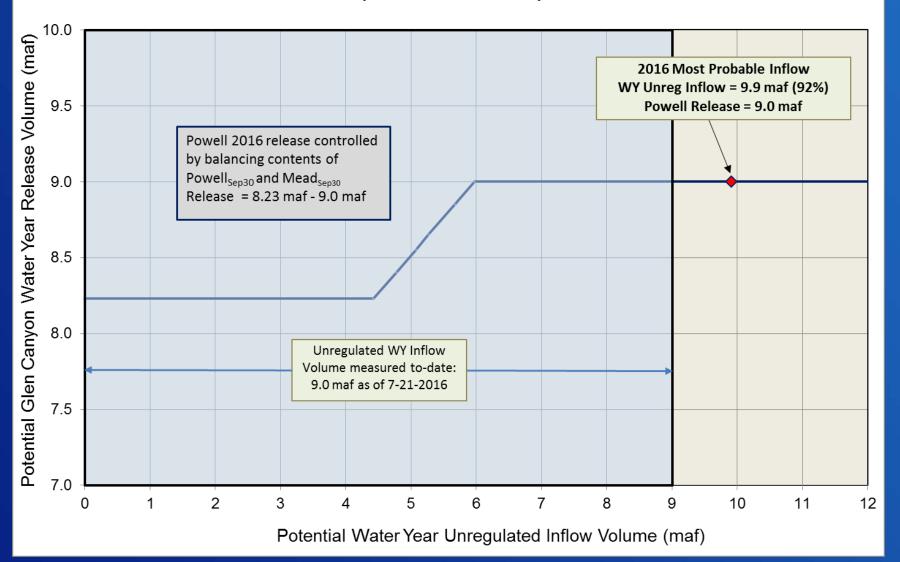
Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada

Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada

Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

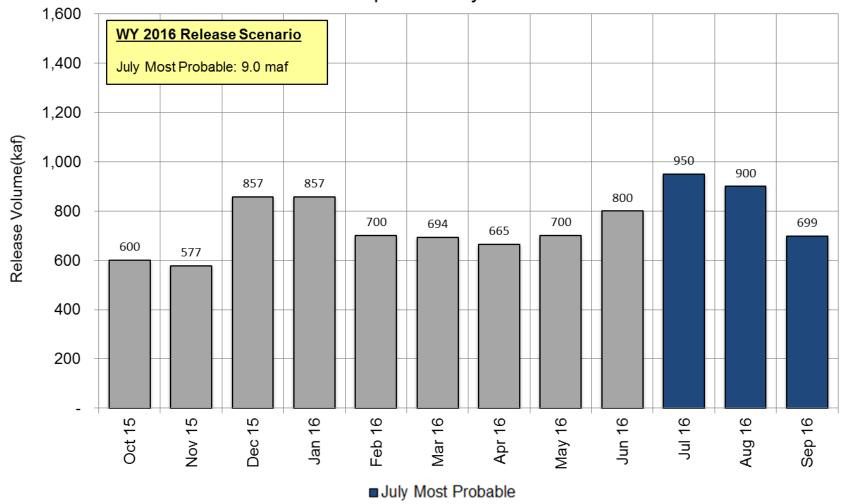
Potential Lake Powell Release Scenarios

Water Year 2016 Release Volume as a Function of Unregulated Inflow Volume based on July 2016 24-Month Study Conditions



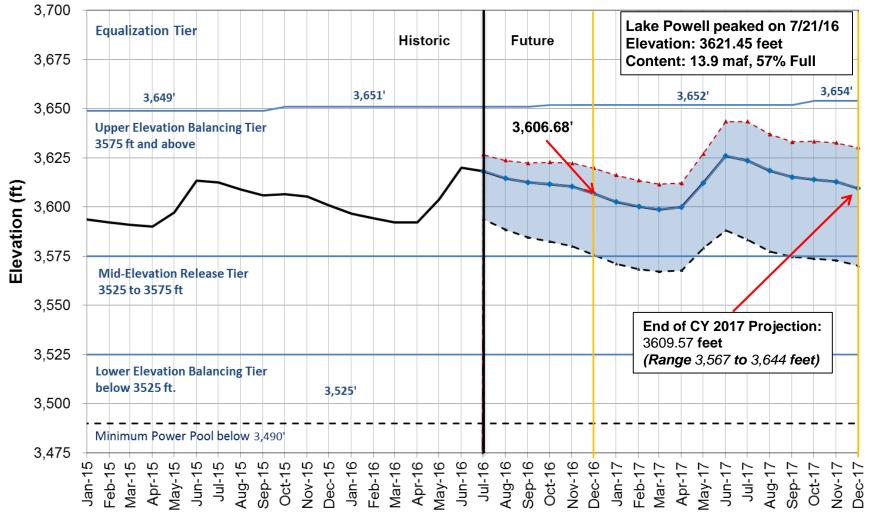
Projected Lake Powell Monthly Release Volume Distribution

Release Scenario for Water Year 2016 Updated July 2016



Lake Powell End of Month Elevations

Historic and Projected based on July 2016 Modeling



Observed Elevations

July 2016 Most Probable Inflow with Lake Powell Release of 9.0 maf in WY 2016 and WY 2017

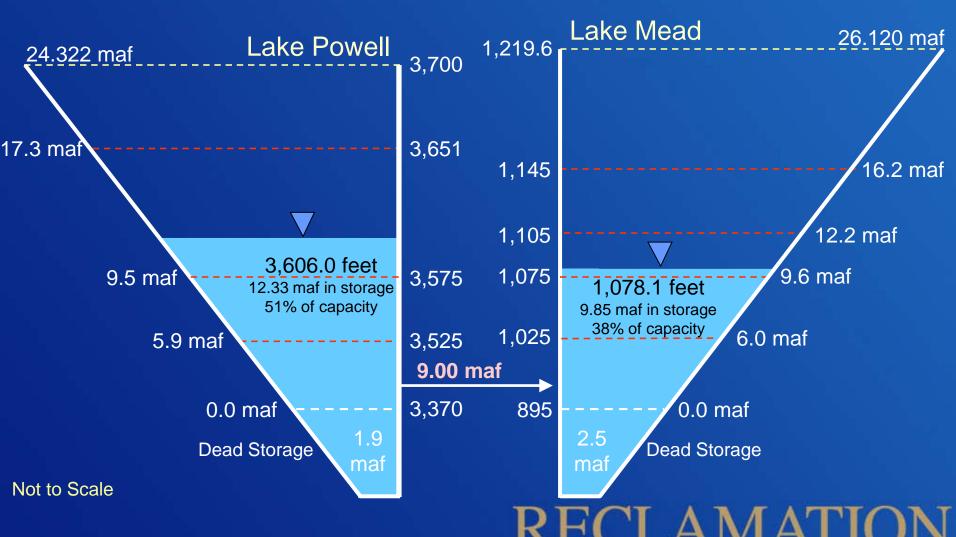
April 2016 Probable Minimum Inflow with Lake Powell Release of 9.0 maf in WY 2016 and 8.23 maf in WY 2017

⁻⁻⁻⁻ April 2016 Probable Maximum Inflow with Lake Powell Release of 9.0 maf in WY 2016 and 11.91 maf in WY 2017

End of Water Year 2015

September 30, 2015

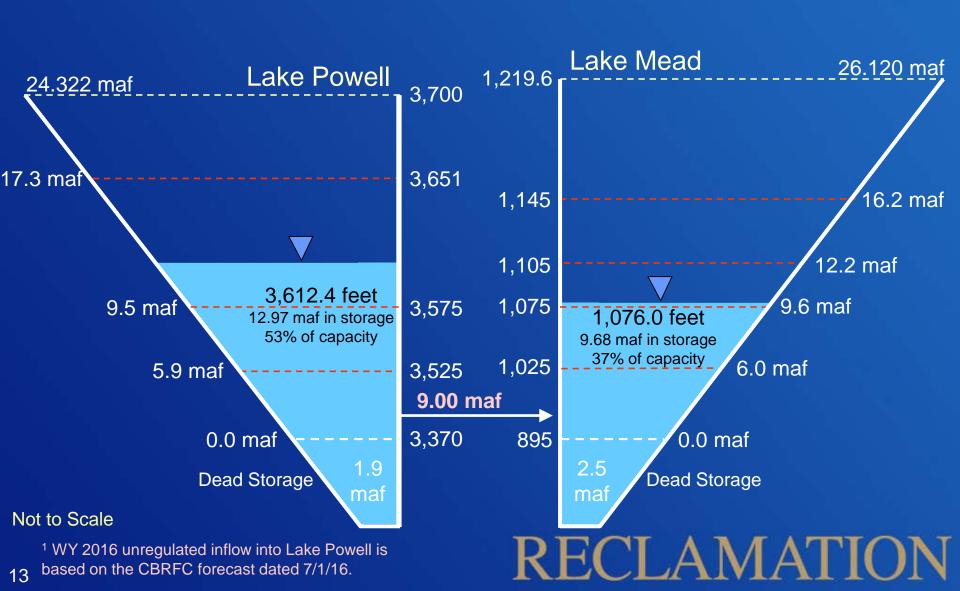
Unregulated Inflow into Powell = 10.17 maf (94% of average)



End of Water Year 2016 Projections

July 2016 24-Month Study Most Probable Inflow Scenario¹

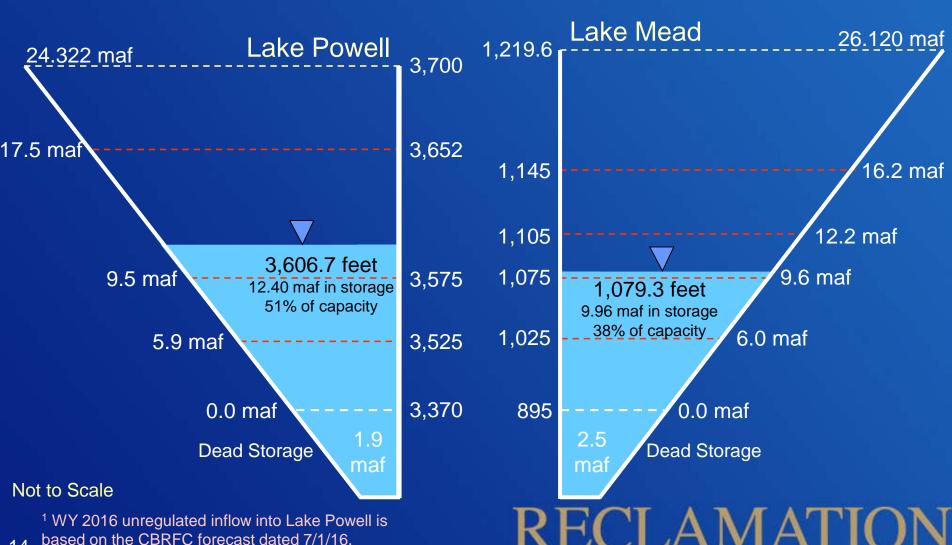
Projected Unregulated Inflow into Powell¹ = 9.92 maf (92% of average)



End of Calendar Year 2016 Projections

July 2016 24-Month Study Most Probable Inflow Scenario¹

Based on a 9.00 maf release pattern from Lake Powell in Water Year 2017



based on the CBRFC forecast dated 7/1/16.

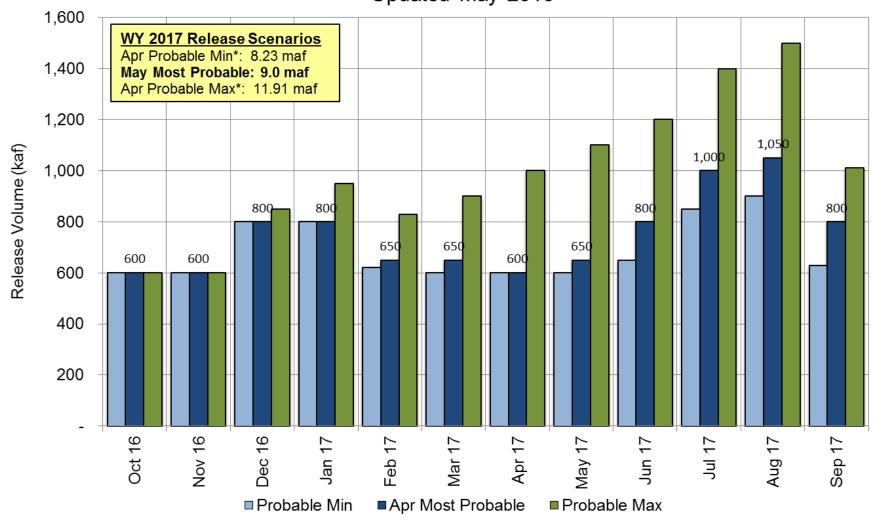
Lake Powell 2017 Operating Tier Scenarios

Based on April and July 2016 modeling

Inflow	Operating Tier
Scenario	Release Volume
Minimum	Upper Elevation Balancing
Probable	8.23 maf
Most	Upper Elevation Balancing
Probable	9.0 maf
Maximum	Upper Elevation Balancing
Probable	11.91 maf

Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2017 Updated May 2016



^{*} Probable Min and Max annual release volume is based on April Min and Max inflow forecasts





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Colorado River Basin Storage (as of July 24, 2016)

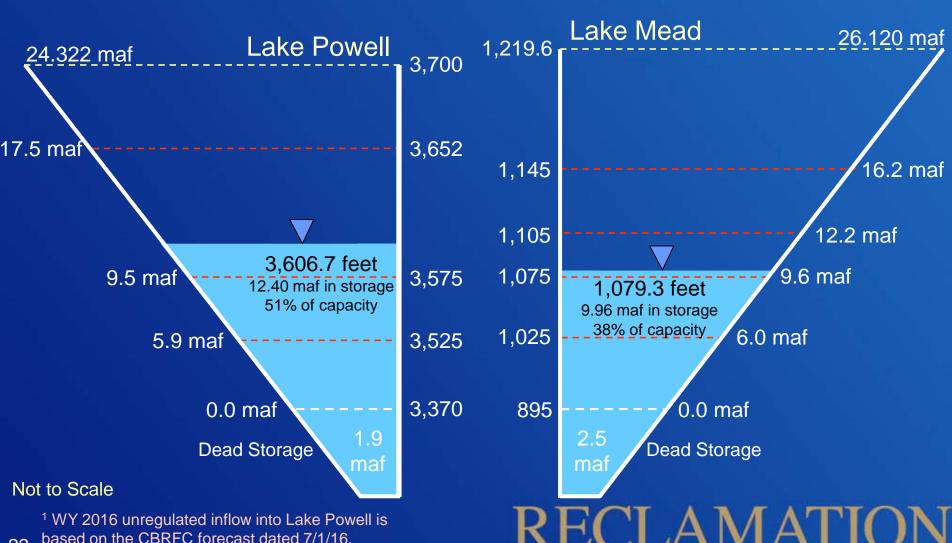
Current Storage	Percent Full	MAF	Elevation (Feet)
Lake Powell	56%	13.70	3,619.4
Lake Mead	36%	9.38	1,072.2
Total System Storage*	53%	31.31	NA

^{*}Total system storage was 31.45 maf or 53% this time last year

End of Calendar Year 2016 Projections

July 2016 24-Month Study Most Probable Inflow Scenario¹

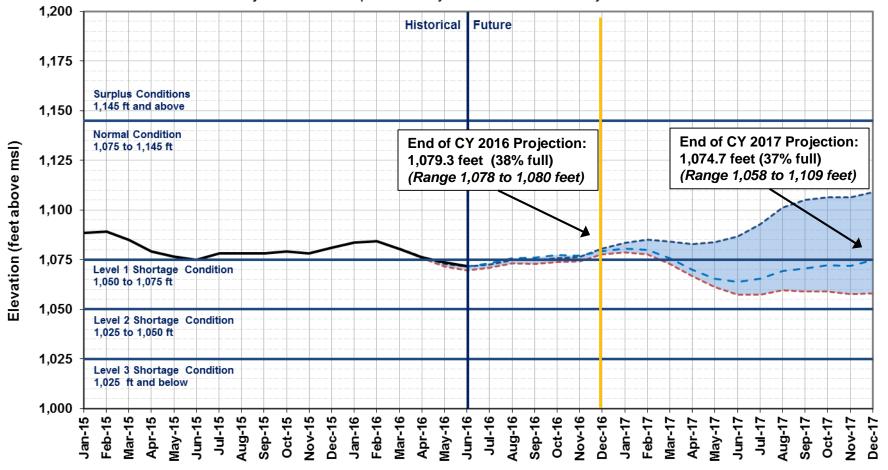
Based on a 9.00 maf release pattern from Lake Powell in Water Year 2017



based on the CBRFC forecast dated 7/1/16.

Lake Mead End of Month Elevations

Projections from April and July 2016 24-Month Study Inflow Scenarios



- ---- April 2016 Probable Maximum Inflow with Lake Powell Release of 9.00 maf in WY 2016 and 11.91 maf in WY 2017
- - July 2016 Most Probable Inflow with Lake Powell Release of 9.00 maf in WY 2016 and WY 2017
- ---- April 2016 Probable Minimum Inflow with Lake Powell Release of 9.00 maf in WY 2016 and 8.23 maf in WY 2017
- Historical Elevations

Lower Basin Side Inflows – WY/CY 2016^{1,2} Intervening Flow from Glen Canyon to Hoover Dam

М	onth in WY/CY 2015	5-Year Average Intervening Flow (KAF)	Observed Intervening Flow (KAF)	Observed Intervening Flow (% of Average)	Difference From 5-Year Average (KAF)
	October 2015	69	118	171%	49
	November 2015	56	41	73%	-15
	December 2015	54	43	79%	-12
CAL	January 2016	62	89	145%	28
HISTORICAL	February 2016	73	81	111%	8
LSH TSH	March 2016	55	31	56%	-24
	April 2016	53	68	127%	14
	May 2016	37	50	134%	13
	June 2016	21	15	70%	-6
	July 2016	78			
	August 2016	124			
FUTURE	September 2016	112			
15	October 2016	69			
	November 2016	56			
	December 2016	54			
	WY 2016 Totals	795	849	107%	54
	CY 2016 Totals	795	827	104%	32

¹ Values were computed with the LC's gain-loss model for the most recent 24-month study.



² Percents of average are based on the 5-year mean from 2011-2015.

YAO Operations Update

Brock Reservoir and Senator Wash
 2016 YTD accumulated storage¹

-Brock 95,093 AF

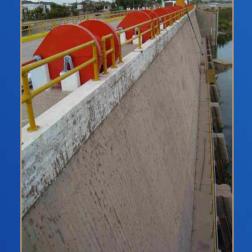
-Senator Wash 37,039 AF



Excess Flows to Mexico

2016 YTD total²

2,069 AF



¹ Provisional year-to-date totals through July 23, 2016

² Provisional year-to-date total through July 24, 2016

YAO Operations Update

- Pumped drainage return flows from the Wellton-Mohawk Irrigation and Drainage District
 - Flow at station 0+00 on the Main Outlet Drain from January through June 2016 was 46,190 AF at 2,640 ppm
- Provisional drainage Flows to the Colorado River
 - From the South Gila Drainage Wells
 January through June 2016 was
 12,010 AF at 1,670 ppm
 - From the Yuma Mesa Conduit January through June 2016 was 0 AF

